

On-Line Flutter Prediction Tool for Wind Tunnel Flutter Testing using Parameter Varying Estimation Methodology, Phase I

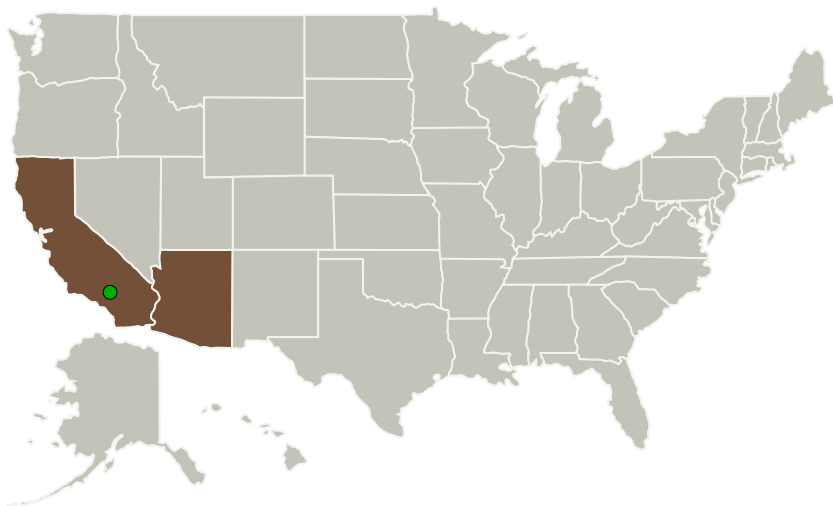
Completed Technology Project (2010 - 2010)



Project Introduction

ZONA Technology, Inc. (ZONA) proposes to develop an on-line flutter prediction tool for wind tunnel model using the parameter varying estimation (PVE) technique to ensure the safety of the flutter model as well as the wind tunnel system. This tool will be applied to rapidly evaluate parameters, such as modal damping and frequency, which are required to assess the flutter boundary of a wind tunnel model in the pre-flutter test conditions. In this PVE Toolbox, system identification techniques such as Polymax and Subspace methods are employed to consistently estimate the damping/frequency of the physical modes, followed by the implementation of Zimmerman-Weissenburger flutter margin method, linear parameter varying modeling combined with μ analysis, and/or thin plate interpolation method for flutter boundary prediction. In order to minimize the dependence on the experience for obtaining a reliable flutter prediction, an accurate estimation of the auto-spectrum of the output data, k-mean stochastic algorithm for automate modes selection are developed to enhance the on-line capability of the PVE Toolbox. The end product PVE Toolbox can be used by the test engineer as an on-line flutter prediction tool in the wind tunnel to effectively make a timely decision for proceeding to the next test point.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
ZONA Technology, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Scottsdale, Arizona
● Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations

Arizona	California
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Project Transitions

▶ **January 2010:** Project Start

✓ **July 2010:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139938>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ZONA Technology, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

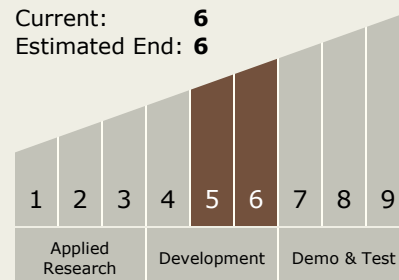
Carlos Torrez

Principal Investigator:

Jie Zeng

Technology Maturity (TRL)

Start: 5
Current: 6
Estimated End: 6



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.8 Ground and Flight Test Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System